

datasheet

# pco.edge 4.2 CLHS

cooled sCMOS camera

resolution

**4.2 MPixel**

pixel size

**6.5  $\mu\text{m}$  x 6.5  $\mu\text{m}$**

interface

**CLHS FOL**



low readout noise  
0.8 e<sup>-</sup> (med)

high resolution  
2048 x 2048 pixels

high speed  
100 fps

high dynamic range  
37 500 : 1

high quantum efficiency  
up to 80 %

## technical data

### image sensor

	slow scan	fast scan
sensor technology	scientific CMOS (sCMOS)	
color type	monochrome	
resolution (horizontal x vertical)	2048 px x 2048 px	
pixel size (horizontal x vertical)	6.5 $\mu\text{m}$ x 6.5 $\mu\text{m}$	
sensor size (horizontal x vertical)	13.3 mm x 13.3 mm	
sensor diagonal	18.8 mm	
shutter mode	rolling shutter (RS) with selectable readout direction	
modulation transfer function (theoretical max.)	76.9 lp/mm	
peak quantum efficiency	80 % @ 580 nm	
spectral range	300 nm - 1100 nm	
dark current (typ.)	0.6 e <sup>-</sup> /pixel/s @ +7 °C sensor temperature	
fullwell capacity	30 000 e <sup>-</sup>	
readout noise (typ.) <sup>1</sup>	1.5 e <sup>-</sup> rms 0.8 e <sup>-</sup> med	1.6 e <sup>-</sup> rms 0.9 e <sup>-</sup> med
dynamic range (intra-scene) <sup>2</sup>	37 500 : 1 (91 dB)	33 500 : 1 (90 dB)

<sup>1</sup> The readout noise values are given as median (med) and root mean square (rms) values, due to the different noise models which can be used for evaluation. All values are raw data without any filtering.

<sup>2</sup> The dynamic range value is calculated with the median value of the readout noise and rounded.

### frame rate table

#### vertical resolution reduction

	slow scan	fast scan
2048 x 2048	35 fps	100 fps
2048 x 1024	70 fps	200 fps
2048 x 512	140 fps	400 fps
2048 x 256	281 fps	800 fps
2048 x 128	562 fps	1600 fps

#### typical resolutions

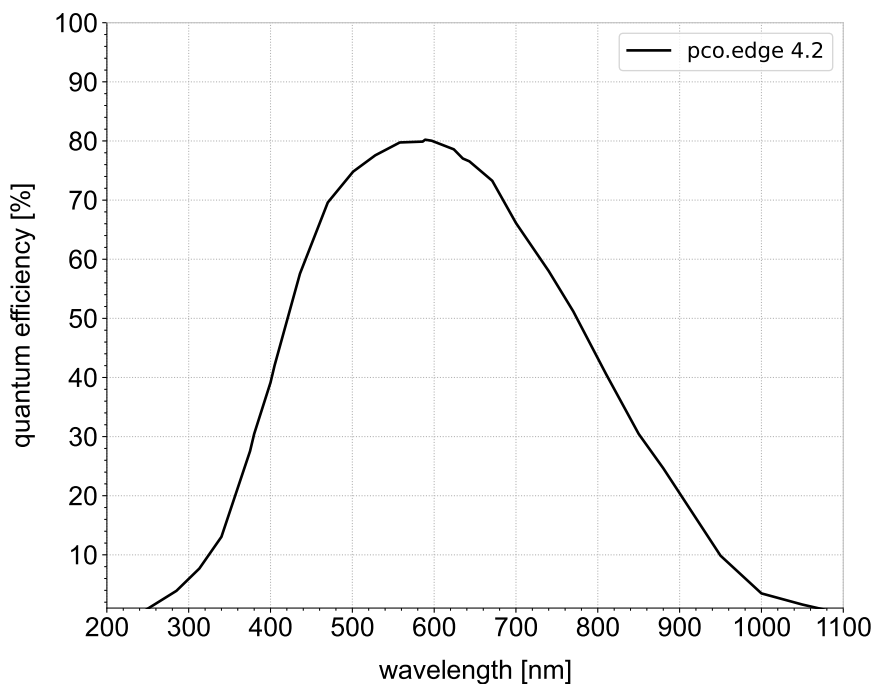
	slow scan	fast scan
1920 x 1080	66 fps	189 fps
1600 x 1200	60 fps	170 fps
1280 x 1024	70 fps	200 fps
640 x 480	150 fps	420 fps
320 x 240	300 fps	853 fps

camera		
	slow scan	fast scan
max. frame rate @ full resolution	35 fps	100 fps
exposure time range	100 $\mu$ s - 10 s	
dynamic range A/D <sup>1</sup>	16 bit	
conversion factor <sup>2</sup>	0.46 e <sup>-</sup> /DN	
pixel rate	200 MPixel/s	548 MPixel/s
region of interest (ROI)	horizontal: steps of 16 columns (min. 64 columns) vertical: steps of 1 row (min. 16 rows)	
binning	horizontal: x2, x4 (sum) vertical: x2, x4 (sum)	
non-linearity	< 0.5 %	
dark signal non-uniformity (DSNU)	< 0.3 e <sup>-</sup> rms	
photo response non-uniformity (PRNU)	< 0.3 %	
cooling temperature image sensor	+7 °C stabilized (up to +27 °C ambient temperature)	
cooling method	forced air optional: liquid cooling	
trigger input signals	external exposure start, external exposure control, sequence trigger, acquire enable	
status output signals	exposure, busy, line	
input / output signal connectors	SMA	
time stamp	in image (1 $\mu$ s resolution)	
data interface	Camera Link HS FOL	

<sup>1</sup> The high dynamic signal is simultaneously converted at high and low gain by two 11 bit A/D converters and the two 11 bit values are sophistically merged into one 16 bit value.

<sup>2</sup> According to EMVA1288, the conversion factor equals the inverse of the system gain and can be operational mode dependent.

## quantum efficiency



## general

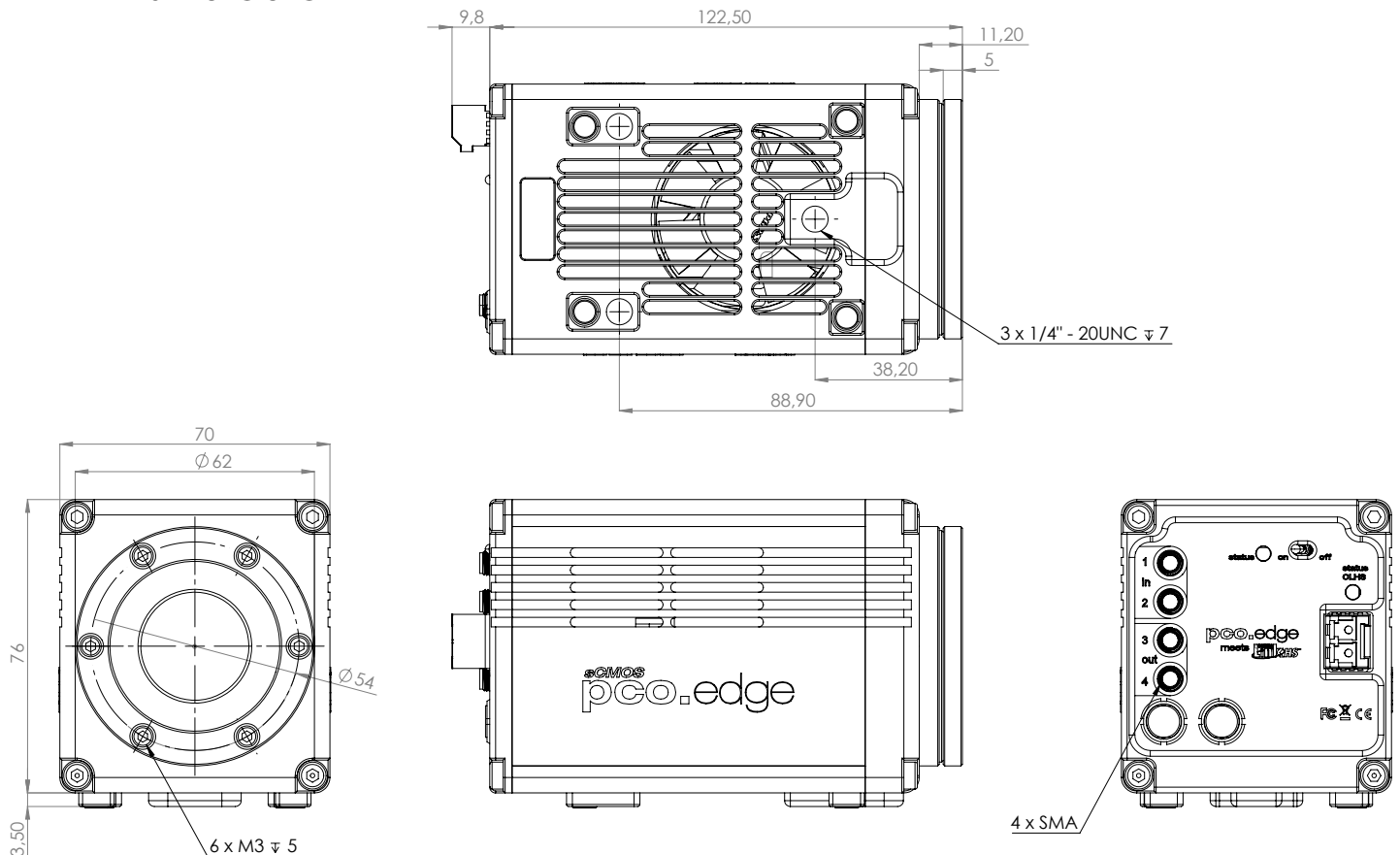
power supply	24 VDC ( $\pm 10\%$ )
power consumption	max. 32 W
weight	0.8 kg air-cooled 1.05 kg liquid-cooled
dimensions (height x width x length)	76 mm x 70 mm x 122.5 mm
operating temperature range	+10 °C to +40 °C
storage temperature range	-10 °C to +60 °C
humidity range (non-condensing)	10 % to 80 % (recommended < 65 %)
certifications	CE, FCC, UKCA

## optical interface

direct mounting distance	11.1 mm ( $\pm 10\%$ )
lens mounting	C-mount, F-mount
optional lens mounting	TFL-mount
optional lens remote control (only air-cooled variant)	EF-mount, EF-S-mount

Configure your optical setup with our **MachVis Lens Selector** online tool.

## dimensions



outlines of pco.edge 4.2 CLHS air-cooled (all dimensions given in mm)

## software

### Your first choice is pco.camware:

Our main camera control software enables control of most camera settings and facilitates image acquisition and storage.

You can customize it exactly to your needs using different layouts, styles and features.

### You prefer to use a different software:

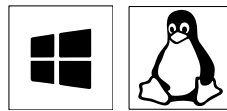
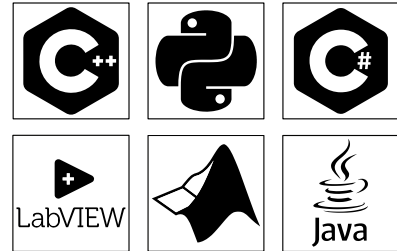
Our cameras integrate with a range of third-party software applications.

In microscopy we offer dedicated support for  $\mu$ Manager, while ensuring compatibility with other software maintained by their providers.

### You want to create your own application:

We feature a wide range of software development kits (SDK) for various programming languages, such as C++, Python, C#, LabVIEW, Matlab, and Java.

If you are looking for more general SDKs, we present pco.sdk and pco.recorder, our low-level SDKs with C interface.



Our software is available for Windows and Linux platforms.

Visit our **website** for detailed information, installation guidance, and Github projects.

## areas of application

3D metrology | biochip reading | brightfield microscopy | calcium imaging | digital pathology | fluorescence microscopy | fluorescence recovery after photobleaching (FRAP) | Förster resonance energy transfer (FRET) | high-content screening | high-speed brightfield ratio imaging | high-throughput screening | image intensifier imaging | industrial quality inspection | lightsheet fluorescence microscopy (LSFM) | lucky astronomy | ophthalmology | photovoltaic inspection | single molecule localization microscopy (SMLM) – PALM, STORM, dSTORM, GSDIM | spinning disk confocal microscopy | structured illumination microscopy (SIM) | super-resolution microscopy | total internal reflection fluorescence microscopy (TIRF) | wafer inspection

### ordering information

<b>pco.edge 4.2 CLHS</b>	85108072309	camera system, 2048 x 2048 pixel, monochrome, rolling shutter, CLHS interface, air cooling
<b>pco.edge 4.2 WAT CLHS</b>	85108072313	camera system, 2048 x 2048 pixel, monochrome, rolling shutter, CLHS interface, liquid cooling

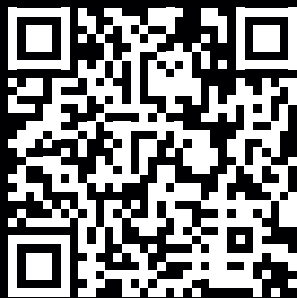
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